

Claims:

1. A centralizer comprising: a generally tubular body having a central opening sufficiently large to allow insertion therethrough of a pipe having an external diameter; a sidewall of substantially uniform thickness including an inner-facing surface directed to the central opening and an outer-facing surface onto which are formed a plurality of outwardly protruding ribs by hydroforming the sidewall.
2. The centralizer of claim 1 wherein the ribs are formed by plastically deforming a tubular work piece outwardly from within its inner bore.
3. The centralizer of claim 2 wherein the plastic deformation is achieved by fluid pressure.
4. The centralizer of claim 1 wherein the ribs are treated to increase their wear resistance.
5. The centralizer of claim 1 wherein the inner-facing surface includes indentations substantially conforming to the position and shape of the ribs.
6. The centralizer of claim 1 wherein the tubular body includes a first end and an opposite end and the ribs are spaced back from the first end.
7. The centralizer of claim 6 wherein the ribs are spaced back from the opposite end.
8. The centralizer of claim 6 wherein the first end is formed to permit attachment therethrough to the pipe.
9. The centralizer of claim 8 wherein the attachment is by crimping.
10. The centralizer of claim 1 including a coating on at least a portion of the inner-facing surface.
11. The centralizer of claim 1 formed of metal.

12. A method for producing a centralizer, the method comprising the steps of: placing a length of metal tubular work piece, the work piece having a sidewall and an central opening, inside a confining surface comprised of mold elements, the mold elements including cavities spaced and shaped in the configuration of desired side wall centralizer ribs, the mold elements being supported substantially against expansion radially outward from their position about the tubular work piece; applying sufficient pressure to the side wall through the inner bore to force the tubular sidewall radially outward against the confining surface and into the mold cavities to plastically deform the side wall to form centralizer ribs on the side wall; and removing the tubular work piece from the confining surface.
13. The method of claim 12 wherein the pressure is fluid pressure.
14. The method of claim 13 wherein the fluid pressure is selected from hydraulic pressure or air pressure.
15. The method of claim 12 wherein the mold elements are substantially cylindrical.
16. The method of claim 15 wherein the mold elements contain slits to permit their circumferential expansion for removal thereof from the tubular work piece.
17. The method of claim 12 wherein the mold elements abut circumferentially at adjacent ends to form the confining surface.
18. The method of claim 12 wherein each mold element defines a portion of a cavity.
19. The method of claim 12 wherein the mold elements contain slits to permit their circumferential expansion.
20. The method of claim 12 wherein the step of placing includes inserting a mandrel into the central opening of the tubular workspace such that a space is formed between the mandrel and the sidewall, sealing about the space and positioning the tubular work piece in the confining space and

the step of applying sufficient pressure includes introducing fluid pressure to the space.

21. The method of claim 12 wherein upon removal of the centralizer from the confining surface, the tubular work piece sidewall is of substantially uniform thickness.
22. The method of claim 12 further comprising applying a coating to the tubular work piece inner surface once the tubular work piece has been removed from the confining surface.
23. The method of claim 12 further comprising treating the ribs to increase their wear resistance once the tubular work piece has been removed from the confining surface.
24. The method of claim 12 wherein removing the centralizer from the confining surface includes expanding the mold elements to overcome their hoop stress.
25. The method of claim 12 wherein the ribs are formed to protrude smoothly from the sidewall cylindrical outer surface.
26. A centralizer formed by the method of claim 12.
27. A method for producing a centralizer for a pipe comprising: providing a tubular work piece selected to be formed into the centralizer having a central opening defining an inner diameter and a sidewall having an inner-facing surface directed toward the central opening and an outer-facing surface; providing a mold including a plurality of elements together forming a inner-surface defining a substantially cylindrical confining space and cavities formed in the inner surface positioned and configured so as to correspond to the position and configuration of ribs to be formed on the centralizer; positioning the tubular work piece and the mold elements such that the tubular work piece is within the substantially cylindrical confining space formed by the mold elements; securing the mold elements about the tubular work piece; applying sufficient fluid pressure against the sidewall to force the sidewall out against the mold elements and into the cavities of

the mold elements to form a centralizer having ribs protruding outwardly from its outer surface; and removing the centralizer from the mold elements.

28. The method of claim 12 wherein the step of placing includes inserting a mandrel into the central opening of the tubular workspace such that a space is formed between the mandrel and the sidewall inner facing surface, sealing about the space and positioning the tubular work piece in the confining space and the step of applying sufficient pressure includes introducing fluid pressure to the space.
29. The method of claim 27 wherein the fluid pressure is air pressure.
30. The method of claim 27 wherein the fluid pressure is hydraulic pressure.
31. The method of claim 27 wherein the mold elements are substantially cylindrical.
32. The method of claim 30 wherein the mold elements contain slits to permit their circumferential expansion.
33. The method of claim 27 wherein the mold elements are separable from each other by way of a circumferential split.
34. The method of claim 27 wherein each mold element defines a portion of a cavity.
35. The method of claim 27 wherein the mold elements contain slits to permit their circumferential expansion.
36. The method of claim 27 wherein upon removal of the centralizer from the confining surface, the centralizer sidewall is of substantially uniform thickness.
37. The method of claim 27 further comprising applying a coating to the centralizer inner surface once the centralizer has been removed from the confining surface.

38. The method of claim 27 further comprising treating the ribs to increase their wear resistance once the centralizer has been removed from the confining surface.
39. The method of claim 27 wherein removing the centralizer from the confining surface includes expanding the mold elements to overcome their hoop stress.
40. A centralizer formed by the method of claim 27.